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LIFE OF SEDGWICK.

I.

The Life and Letters of the Reverend Adam Sedgwick, LL.D., D.C.L., F.R.S., Fellow of Trinity College, Cambridge, Prebendary of Norwich, Woodwardian Professor of Geology, 1818–73. By John Willis Clark, M.A., F.S.A., and Thomas McKenny Hughes, M.A., F.R.S. Two Volumes. (Cambridge: University Press, 1890.)

BETTER late than never! Geologists have waited for seventeen years for a life of Sedgwick, though the biographies of Murchison, Lyell, and Darwin, two of whom survived him, have all been published. The delay, as is admitted in the preface, requires some explanation: whether that is really furnished may be doubted. This at least is clear, that it has not been due to Mr. Clark, since he only undertook his portion of the work, and that the major one, in 1886. The delay is the more to be regretted because not a few of those who could remember Sedgwick in the days of his full vigour have passed away, and, as Mr. Clark observes, "a number of interesting letters which he is known to have written, and which were long carefully preserved, have either been destroyed or cannot now be traced. These remarks apply specially to the earlier years." Still, Mr. Clark has had at his disposal a large amount of material, from which he has drawn a picture no less vivid than accurate—as we feel sure those who knew the original will admit—of a man of remarkable genius and almost unique personality. He has told us the story of Sedgwick's life, he has woven into it Sedgwick's letters, and the result is a book which is worthy to be classed with the two best biographies, at any rate of recent date, of distinguished sons of Cambridge—those of Charles Kingsley and Charles Darwin.

This book has its value as a chronicle of the development of geology into a distinct and independent branch of science, but this is not its only interest. True, it is a record of a life comparatively uneventful. It was not often that Sedgwick's geological studies conducted him beyond the limits of the British Isles. His Continental journeys were restricted to the western half of Europe, and did not include Spain or Scandinavia, but his friends were numerous and notable. His life extended over a period of our national history of unusual interest. He remembered vividly the great incidents of the "struggle for life and death with France." He heard the death peal rung for Nelson and for Wellington: he had shared in the domestic strife of the Reform Bill, and had witnessed the blunders of the Crimea and the peril of India. His sympathies were as quick as they were wide, and he was not only a frequent letter writer, but also a master of that almost forgotten art. Hence these volumes contain much that will be interesting to others than geologists. They are the record, not of a life devoted solely to one special study, but of a man of varied interests and rare enthusiasm, of unusual eloquence and exceptional descriptive powers. Not the least valuable part of the work is Sedgwick's own account (extracted from a privately printed pamphlet) of the manners and customs of the dalesmen of the Sedbergh district, among whom he was born, whither he constantly returned, and which he loved to the last hour of his life.

This book brings before us Sedgwick as a man and as a geologist, a division which corresponds with the work of its joint authors. Though the two characters made up the one personality, and a distinction between them must be to some extent arbitrary, this may be adopted, as a matter of convenience, in endeavouring to give some idea of the varied contents of these volumes.

Adam Sedgwick was born in the year 1785, the fourth child of the Rev. Richard Sedgwick, vicar of Dent, an old-world village, by a tributary of the Lune, among the great hills of Western Yorkshire. He was a member of one of the families of "statesmen" which had been settled in Dent for more than three centuries. Till he was sixteen years old he was taught at the Grammar School, partly by his father; then he was sent to school at Sedbergh; thence he went, in his twentieth year, to Trinity College, Cambridge, after a few months' tuition by John Dawson, a country surgeon (he had ushered Sedgwick into the world) who had become eminent as a mathematician, as teacher no less than as investigator. Sedgwick's work at Cambridge was interrupted by an attack of typhoid fever which nearly proved fatal, but, notwithstanding this, he obtained a scholarship in his College, and the fifth place among the Wranglers in the Mathematical Tripos of 1808. Private pupils and reading for his Fellowship employed him for the next two years, the latter being obtained in the year 1810. The double work proved a severe strain to Sedgwick's constitution. The great importance which has always been attached at Trinity College to the examination for fellowships has its advantages and its disadvantages; the one as affording an opportunity for remedying ill-fortune at the time of the degree and widening the field of choice; the other as giving an advantage to the wealthy, and pressing heavily on those who must combine work for a living with study for an examination. Not a few of the latter have paid for success by permanent injury to health. Among these, it appears, Sedgwick must be reckoned. During the next three years he was out of health, and in 1813 came a complete breakdown. Consumption was apprehended; but at last his naturally strong constitution triumphed, and he was able to return to Cambridge and take part in the regular tuition of the College. In 1816 he was ordained. Three years later came the great crisis of his life—the Woodwardian Professorship of Geology, hitherto little more than a sinecure, became vacant, and Sedgwick declared himself a candidate. His prospects of success at first did not seem great, for he had little, if any, knowledge of the subject, and was opposed, not only by a member of his own College, but also by the Rev. G. Gorham, of Queens' College, who was reputed to have devoted much attention to geology, though he does not appear to have published anything. But the opponent from within the walls of Trinity retired, and then Sedgwick had an easy victory over the other. Cambridge—perhaps Oxford also—has often been rather eccentric in her elections to professorships, and prone to act on the maxim "*Omne ignotum pro magnifico.*" But on this occasion the leap in the dark was more than justified.

Neither of Sedgwick's opponents afterwards made any name as geologists, though the second of them lived to fight a battle for religious freedom in the Church of England.

At once Sedgwick threw himself heart and soul into his subject. Geology at that time signified little more than an excrescential growth from mineralogy, which became the less scientific the further it departed from its support. Still, the Geological Society of London had already been founded full ten years; and the men were now hard at work who were to roll away the reproach from geology, and lay its foundations on the sure ground of observation and induction. Neptune had failed to extinguish the torch of Pluto, and the Wernerians were retreating before the Huttonians; William Smith had already published his wonderful maps, and had set in order, almost single-handed, the newer rocks of England; but below the base of the Carboniferous system a great field for research still remained, in which the generation of Sedgwick's more immediate contemporaries were destined to win their laurels.

Sedgwick's first geological journeys were in Derbyshire and Staffordshire, in the Isle of Wight, and on the coast of Suffolk. But the learner quickly became an investigator. Even in 1818 he began to attack the problems presented by the older rocks of the south-west of England; thence he turned aside to examine Eastern Yorkshire and Durham. Difficult problems seemed from the first to have for Sedgwick a peculiar fascination, and in 1822 he grappled with those presented by the Lake District. In 1827 began his association with Murchison, whom he accompanied in a geological tour to Scotland, and joined in a paper on the results. The following summer saw them companions in their notable researches in Germany and the Tyrol, which produced another joint communication. By this time Sedgwick's merits had been recognized by his election to the Presidency of the Geological Society.

The year 1831 brought two important crises in Sedgwick's life—the one the offer of a valuable living from the Lord Chancellor, the other the beginning of his work in North Wales. That offer he declined, making a mistake, as several of his friends thought—an opinion to which his biographer inclines. Probably Sedgwick would have been a healthier man in a country rectory—for the climate of Cambridge was not suitable to him—and a happier man in married life. But science, we think, would have lost. It might not have been so with some men, but it was Sedgwick's nature to throw himself with all his heart into whatever work he undertook; so that in all probability the interest felt for his parishioners and his home circle would gradually have extruded geology from his thoughts. In this case science would have had to wait some time for the unravelling of much complicated stratigraphy; the collections of the Woodwardian Museum might have remained in a comparatively impoverished condition, and the University would have lost the quickening action of Sedgwick's influence on generations of its students.

Next year Sedgwick took a new departure in authorship. A College Commemoration sermon, which he had been asked to print, increased under his hands, with a prefatory head and a commentarial tail, till the "Discourse on the Studies of the University of Cambridge" expanded into a book, and became, as he phrased it, "a grain of wheat between two millstones." In 1834 he was made a Prebendary of Norwich, a preferment which, though its duties often seriously interrupted his scientific work, was a welcome addition to his income, which up to that time had hardly sufficed for the numerous calls upon it.

For the next six years his work in the field was less and his papers rather fewer; henceforth interruptions obviously became more frequent. The rearrangement of his fine geological collections, for which at last a museum had been provided; political incidents, in which he took an active interest; visits to and from distinguished friends, which became more numerous as his fame increased—all these proved, as they always prove, detrimental to work which requires steady and continuous application. But as the scientific interest of the book wanes a little, its general interest increases. Graphic sketches of notable personages appear more frequently in Sedgwick's letters, which come nearer to being a journal of his life. They bring out also—for many of them are written to young folks—all the tenderness of his nature: they intersperse fatherly advice with accounts of his doings, now grave, now comic. One moment he pulverizes a scientific foe; the next, gives his niece a ludicrous lesson on the pronunciation of Welsh. The election of Prince Albert to the Chancellorship of the University of Cambridge, in which Sedgwick took a leading part, still further interfered with his devotion to science, for it led to his acting as the Prince's secretary in Cambridge, and holding a place on a Commission for the Reform of the University. This, however, is a gain to the book, for his private letters give many interesting details of the Royal visit to Cambridge, and especially of the home life of the Queen and Prince Albert at Osborne.

After a time, about the year 1851, the Silurian question, presently to be noticed, spurred Sedgwick into renewed activity in his old field of work, but led to the unhappy result of his alienation from Murchison and his estrangement from the Geological Society. The burden of years, however, was now beginning to make itself felt, for in 1855, when he reviewed the controversy in his introduction to McCoy's "Description of British Palæozoic Fossils," he attained the age of threescore and ten. Henceforth the path of his life became sadder; one by one friends passed away, the infirmities of age increased, and though at times the old fire flashed up, and for a while the racy phrase and eloquent speech would return, he now felt, as most must feel, something of the *pœna diu viventibus.* Still he was able, up to about 1863, to take occasionally an active part in passing events, though more and more he was compelled to avoid excitement and fatigue, and thus his life at Cambridge was often lonesome. During the last ten years he sometimes suffered severely; almost he might have described himself as "sans teeth, sans eyes," sans ears, though happily not "sans everything," for the mind, as his letters show, continued unclouded, though, of course, sometimes that memory, once so marvellously retentive, failed a little. No part of the book is more tender, none more sympathetic, than the account of Sedgwick's last years. Early in 1873 came the closing scene, in the rooms in Trinity, which had been for so many years his chief home.

> "There was no change till about midnight," writes his niece, "and then we saw the shadow of death come softly over his face, and we knew that he had passed into the dark valley, and that the end was near; but there was no pain; only quiet sleep. His breathing again grew more faint and soft; and without a sigh, just as the clock in the great court of Trinity chimed a quarter past one, his spirit returned to God."

Sedgwick's original scientific work will be sketched in another notice. This may conclude with a word on the man himself. A stalwart figure with rugged features and brown complexion, a flashing eye, and a grand pose of the head, which always reminde me of an eagle. He called himself—men called him—ugly. This I never could understand. Few were better tellers of a story: his memory of striking details, his sense alike of humour and of pathos, were so strong. As a lecturer he was discursive, but suggestive—one who stimulated and fertilized rather than who trained. His speeches were marked by a curious play of fancy, unexpected transitions from grave to gay, and occasional bursts of eloquence, which our greatest orators might have been glad to own. As a writer he was often diffuse, sometimes laboured—the results of hurried work or unsystematic arrangement; yet he broke out occasionally into passages of singular force and vigour. For instance, the concluding paragraphs of his preface to the "Catalogue of Cambrian and Silurian Fossils"—his last contribution to literature—are worthy, in my judgment, of a place among the best extracts from English literature. He was sometimes strong and even narrow in his prejudices, as will appear hereafter; he was impetuous in temper, fierce in the fray, positively ripping up an incompetent antagonist; yet he was commonly the most genial and placable of men; he was tender as a woman to those who sorrowed and who suffered, and was the idol of little children.

We may close the present notice with the words with which Mr. Clark concludes his own part of the biography —the words of one of Sedgwick's intimate friends:—

> "He was transparent and straightforward—the very soul of uprightness and honour—tender and affectionate—most generous and kind. He had a hatred of all duplicity and meanness. He was entirely unsuspicious of evil, unless it was forced upon his notice; and he expected and believed everyone to be as straightforward and truthful as he was himself. I do not think that any man was so beloved by his friends as he was."

T. G. BONNEY.

(*To be continued.*)

GÉRARD'S "ÉLECTRICITÉ."

Leçons sur l'Électricité, professées à l'Institut Électrotechnique Montefiore annexé à l'Université de Liége. Par Eric Gérard, Directeur de cet Institut. (Paris: Gauthier-Villars, 1890.)

THE author of this book says in his preface that when he took charge of the classes in electric technology at Liége he felt the want of a text-book which would give a clear and definite account of electrical phenomena without requiring more extensive mathematical knowledge than his pupils might be expected to possess. We think that in this respect the experience of most teachers of electricity will coincide with that of M. Gérard. There are very few text-books on electricity in which the happy mean between utter vagueness and methods requiring the use of high mathematical knowledge has been hit; this, however, has been done so successfully in the book before us, that we think the difficulty to which we have just alluded will be almost removed. In this book we have the main outlines of electricity explained in language at once intelligible and precise, and without introducing more mathematics than every student of the subject ought to be competent to follow. In a subject like electricity, where forces have to be compared, the geometrical properties of bodies of various shapes utilized, &c., it is evident that if any numerical results at all are to be attained, some mathematics must be introduced; the question as to how much mathematical knowledge should be expected of students who, as a working hypothesis, may be assumed not to have any special aptitude for that study is one on which opinions will differ. For our part, we think that, even regarding it solely from the point of view of the engineer or physicist, such students ought to be advised to acquire an elementary knowledge of the differential and integral calculus; the possession of this knowledge will make many parts of the subject easy which without it would be difficult, and the time spent in acquiring the mathematics will be much more than saved in the time spent over the physics. In the book before us the mathematics are as plain and straightforward as possible. At the same time, M. Gérard, very wisely we think, does not scruple to use the elements of the differential and integral calculus.

The work contains more than 500 pages, of which about 200 are devoted to the theory of Dynamos. The remainder consists of an exceedingly clear and accurate description of electrical phenomena, the subject throughout being treated from Maxwell's point of view. The book is brought well up to date, and contains an account of most of the recent researches in electricity and magnetism; we think, however, it would have been improved by references to the places of publication of the original papers in which these researches are described, so that a student who wishes for a more detailed description than could be given in an elementary text-book might be able to refer to the original authorities for himself.

A most excellent feature of the book is that M. Gérard does not treat the subject as if an investigation was complete when it had led to a relation between a number of symbols. He applies the equations he gets to actual cases, and thus familiarizes the student with the magnitude of the quantities with which he is dealing. He commences the book with Sir William Thomson's maxim, which is so excellent in physics, though its application to other subjects might possibly cause consternation, that "we cannot understand a phenomenon until we can express it in numbers," and he acts up to the spirit of this maxim all through the book.

The book is well and clearly printed, and the author has realized the fact that it is more important that the diagrams in a text-book of physics should be explanatory than that they should be elegant.

There are one or two points which we think might be corrected in a new edition, which we are sure will soon be required. The deformation of dielectrics under elec-